DOCUMENT RESUME

ED 250 550 CE 040 097

AUTHOR Enochs, J. R.; And Others
TITLE The Relationship of Learning Style, Reading Vocabulary, Reading Comprehension, and Aptitude for Learning to Achievement in the Self-Paced and Computer-Assisted Instructional Modes of the Yeoman "A" School at the Naval Technical Training Center, Meridian.
PUB DATE Nov 84
NOTE 28p.; Paper presented at the Annual Meeting of the Mid-South Educational Research Association (13th, New Orleans, LA, November 14-16, 1984).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; *Academic Aptitude; Adult Education; Adult Programs; *Cognitive Style; Comparative Analysis; *Computer Assisted Instruction; Educational Strategies; Individualized Instruction; Influences; Military Personnel; Military Training; *Pacing; Postsecondary Education; Predictor Variables; Pretests Posttests; Program Effectiveness; Reading Comprehension; *Reading Skills; Teaching Methods; Vocabulary
IDENTIFIERS Naval Training; Navy

ABSTRACT

A study examined the relationship of learning style, reading vocabulary, reading comprehension, and aptitude for learning to achievement in the self-paced and computer-assisted instructional (CAI) modes of the Yeoman "A" School at the Naval Technical Training Center in Meridian, Mississippi. To gather data for the study, researchers conducted a pre- and posttest comparison of two groups of 50 Navy Yeoman "A" School students. The following instruments were used in the study: the Learning Styles Inventory, the Armed Services Vocational Aptitude Battery (ASVAB), the Nelson-Denny Reading Test, and the Yeoman "A" School Achievement Test. When preachievement was controlled statistically, the CAI group achieved significantly higher than did the traditional self-paced instruction group. Overall, the best predictors of achievement among all of the students were pretest scores, knowledge of mathematics, word knowledge, and mechanical comprehension. It also appeared that students achieve in different instructional settings relative to their aptitudes, achievement in reading, and learning styles; for example, those doing better in the CAI program seemed to be more concerned with abstractions and less concerned with concreteness, a trait identified with higher mathematical aptitude. (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

CE

ED250550

THE RELATIONSHIP OF LEARNING STYLE, READING VOCABULARY, READING COMPREHENSION, AND APTITUDE FOR LEARNING TO ACHIEVEMENT IN THE SELF-PACED AND COMPUTER-ASSISTED INSTRUCTIONAL MODES OF THE YEOMAN "A" SCHOOL AT THE NAVAL TECHNICAL TRAINING CENTER, MERIDIAN

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

J. Wollenberg

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BY

Dr. J. R. Enochs

Dr. H. M. Handley

Dr. J. P. Wollenberg

ED400997

ACKNOWLEDGEMENTS

The writers express appreciation to CDR Barbara F. Beil, Commanding Officer, Naval Technical Training Center, Meridian, Mississippi for permission to conduct the research study, and her continuous encouragement and cooperation during the research study. To LCDR Kenneth D. Muller, Director of Training, the writers express their thanks for his guidance and support.

To the various staff members of the Navy Yeoman "A" School at the Naval Technical Training Center, who gave their input, encouragement, and time to the research study, the writers extend their thanks.

Gratitude is extended to Dr. Erik J. Meyer, Educational Specialist, for his valuable assistance in administering tests.

INTRODUCTION

A Navy student's performance in a specific learning enterprise in the "A" school may be affected by factors other than classroom training and related learning experiences (Astin, 1971; Boclair, 1980; Borup, 1971). Such variables as learning style, aptitude, and level or reading mastery may impact on student performance.

The Navy cannot assume that all students will learn through arbitrary teaching strategies. Learning styles, in particular, have dominated the interest of many educators (Canfield, 1980; Dunn, 1978; Gregorc, 1979; Hill, 1971; Kolb, 1981; Reckinger, 1979). Learning style is a special interest because individuals have preferred ways to analyzing and synthesizing all they see, remember, and think about in specific educational settings (Messick & Associates, 1976). Consequently, individuals differ in style, rate, and overall quality of learning. The style of learning also influences teacher and student interaction and emphasizes the variety of ways in which individuals may differ from one another. Conceptually, people of varying ages and intellectual capacities learn differentially. Therefore, selected methods of instruction are effective with some students while being ineffective with others (Dunn & Dunn, 1979; Emmer, 1974; Young, 1977).

The purpose of this research was to determine how the performance of two groups of Navy Yeoman "A" School students taught a common instructional unit through two different approaches was related to the selected variables of learning style, aptitude, reading vocabulary score, and comprehension score.

Consequently, as individual needs are identified, educational strategies may be adapted to better serve the particular needs of each Navy Yeoman "A" School student. Navy training programs may be enhanced further through the utilization of information derived from this research.

No research exists which establishes the relationship between and among the specific variables of learning style, aptitude, and reading vocabulary and reading comprehension that contribute to the Navy students successful performance in a basic Yeoman "A" School in a common instructional area taught by traditional self-paced instruction and computer assisted instruction.

Many authorities believe that how students learn is perhaps the single most important factor in their academic achievement (Dunn & Price, 1977; Reckinger, 1979; Robinson & Gray, 1974). A recognition of individual differences in learning styles can help the Naval curriculum planner understand why some students have difficulty in mastering specific skills (Dunn & Dunn, 1979). Proponents of the learning styles movement further propose that variability in student performance results not so much from discrepancies in intelligence but that such deviations are due to different styles of learning (Barbe & Swassing, 1979; Gregorc & Ward, 1977). In support of this viewpoint, investigations have demonstrated increased academic achievement among students taught as a function of their individual learning styles (Carbo, 1980; Clements, 1976).

An increasing body of knowledge indicates students learn more effectively when taught through an individualized learning style characteristic. Such a thorough understanding of a student's unique style can help educators develop strategies, techniques, and programs that are responsive to individual needs (Griggs & Price, 1980). Because research has documented major individual differences, a student's individual style

of learning influences other areas of cognitive functioning as well (Levin, 1974; Marcus, 1977). Currently more information and understanding are being generated regarding the nature of cognitive structure than in the past; therefore, increased motivation and achievement are apparent when students are taught through methods that accommodate their learning style (Dunn & Dunn, 1979). There is a need for continuous research in this area in order to understand even more about the human mind and how people learn (Gregorc, 1979; Hart, 1978).

The Navy recognizes the need for academic planning and advisement systems. The accommodation of individual learning styles cannot only enhance academic development and maximize educational potential, but may also accommodate both teaching strategies and learning styles in the decision-making process as well (Abel, 1980; Hines, 1981). Because Navy students need assistance in integrating a Naval specialty and life goals, a need exits to revitalize instruction in order to help design a more integrated teaching/learning situation. Individual styles of learning, as well as additional selected variables, should be analyzed and incorporated in the learning process (Johnson, 1979; Titley & Titley, 1982; Walsh, 1979).

In a model designed by White and Bigham (1982), which was based on an information system approach to instruction, an individualized academic system was developed to focus on individual characteristics of students. It was also developed to assist students, through careful planning, in reaching educational and personal goals. As a result of reviewing White and Bigham's model, the basic rationale of this study evolved.

The Research Problem

The problem of the study was to determine if there are significant differences in achievement promoted by traditional self-paced instruction

and computer assisted instruction in a common instructional area among Navy Yeoman "A" School students.

Research questions to be investigated:

1. When differences in aptitude and pre-achievement of the Yeoman "A" School students are statistically controlled, will there be significant differences in achievement between those taught traditionally in the self-paced mode and those using CAI on common units of material?
2. What combination of the following variables are best predictors of achievement among Navy Yeoman "A" School students trained at the Naval Technical Training Center, Meridian, Mississippi?
   a. Learning styles of students
   b. Reading vocabulary and comprehension
   c. Aptitude for learning
   d. Method of instruction
3. Are there differences in relationships between learning style, reading and aptitude variables for achievement of "A" school students taught by computer assisted instruction and traditional self-paced instructional techniques?

Overview of the Research Design

A pretest-posttest comparison group research design was used for this research study. Two groups of 50 Navy Yeoman "A" School students, those taught traditionally in the self-paced mode and those taught through CAI, served as subjects for the Learning Styles Inventory and the Nelson-Denny Reading Test prior to initiation of the research study. Their aptitude for learning scores were also collected from their service records with the identity of the students limited to the Department of Defense

personnel. In addition, the Yeoman "A" School Achievement Test used to assess learning was administered on a pretest basis.

The Yeoman "A" School students were taught a series of lessons based on materials common to the curriculum of both the traditional self-paced instructional group and the CAI group. At the end of the instruction, the two groups were posttested in achievement, using the same Yeoman "A" School Achievement Test used in the pretest administration.

Yeoman "A" School Description

The Yeoman "A" School is designed to provide the operating forces with personnel capable of performing job entry level (E-1, E-2, E-3) tasks by providing organized and intensive training enabling the trainees to make practical application of concepts learned or knowledge gained for that required of a Yeoman Seaman Apprentice.

The Yeoman performs administrative and clerical work. Yeoman receive visitors, telephone calls and incoming mail. They type, organize files and operate duplicating equipment such as mimeograph and copying machines. They also order and distribute supplies. The instructional sequence was 10 - 14 days.

Measuring Instruments

The following instruments were utilized in this research study: Learning Styles Inventory, The Armed Services Vocational Aptitude Battery (ASVAB), The Nelson-Denny Reading Test and the Yeoman "A" School Achievement Test.

The Learning Styles Inventory was initially published in 1972, but has been continuously revised in content and format. It was developed by Albert Canfield and focuses on four major subscales: Conditions, Content, Mode and Expectations. The four subscales on the Learning Styles Inventory

are described as follows. The subscale, conditions, measures motivational qualities. Approximately two-fifths of the items in the inventory are designed for this purpose. The items focus on four motivational areas. These areas are affiliation, eminence, structure, and achievement. The subscale, content, measures student comparative levels of interest. Six items in the inventory are designed for this purpose. The items focus on four major areas of interest. The areas are number or mathematical, qualitative or verbal, inanimate or manipulative, and people or interactive. The subscale, mode, measures student preference for four different kinds of learning modes. These four learning modes are listening or auditory, reading, iconics, and direct experiences with subject matter. Within the expectation subscale, the collection of data from which an expectancy score is developed constitutes a major portion of the inventory. The score reflects the prediction of success or failure for the individual learner. The expectancy levels are divided into outstanding or superior, above average or good, average or satisfactory, and below average or unsatisfactory. The Learning Styles Inventory is presently being used in approximately 43 states and 3 foreign countries to measure some of the variables that affect learning. It is published in two forms designed for use with grades six through university post-graduate levels. Form S-A consists of 30 items and was used in this research study. Form S-B consists of only 25 items. Scale reliabilities ranged from .59 to .92 in the initial publication (Canfield, 1980).

The Armed Services Vocational Aptitude Battery (ASVAB) was first developed in the 1960s as a military aptitude test for high school students and was shown to be advantageous in terms of recruitment of people. This led to the development of the expanded ASVAB in the late 1970s. The battery is administered to recruits as an aid in determining their eligibility to attend class "A" schools in the Navy. The component

tests of the ASVAB used in this research study are General Science (GS), Arithmetic Reasoning (AR), Word Knowledge (WK), Numerical Operations (NO), Mathematical Knowledge (MK), Mechanical Comprehension (MC), Electronic Information (EI).

The General Science (GS) test contains physical science and biological science items. Arithmetic Reasoning (AR) is a test covering reasoning problems involving arithmetic processes. Word Knowledge (WK) is a test of vocabulary. The Numerical Operations (NO) test involves rapid performance of the four basic math operations using whole numbers. It is not intended as an arithmetic or mathematics test. The Mathematical Knowledge (MK) tests ability to solve general mathematical problems, including some elementary algebra and geometry. Mechanical Comprehension (MC) is a test covering mechanical principles such as use of levers, pulleys, gears, and simple construction. The Electronics Information (EI) involves elementary knowledge of electrical, radio, and electronics information (Bureau of Naval Personnel Manual, 1440220, 1978).

The Nelson-Denny Reading Test, Form C (1973), is designed for students in grades 9 to 12 and adults. The vocabulary section of the test consists of 100 items and the comprehension section of the test consists of 36 items. Both sections are composed of multiple-choice type questions, with each subject having five different response sets per question. In order to find a grade placement, raw scores are computed on a table which is used to convert raw scores to grade equivalencies. The Nelson-Denny Reading Test is intended to be valuable in predicting, screening, and diagnosing reading deficiencies. It is evident that the vocabulary scores are the most reliable. The comprehension score is given double weight when computing a total score. The total score is the part of the test considered to be the best single indicator of reading ability. From the scores, the overall

quality of reading can be evaluated. Reading strengths and weaknesses can be assessed. The most convincing evidence of validity is the user's personal examination of the test and whether the consumer views the items as actually meeting local objectives. The reliabilities for grades 9, 10, 11, and 12 are .82, .87, .91, and .91 respectively for vocabulary and .68, .66, .78, and .74 respectively for comprehension. Reliabilities are also given for reading rate, an added feature. The predictive validity for this test is not given (Buros, 1978). Vocabulary and reading comprehension scores were employed as predictor variables in this study.

The Yeoman "A" School Achievement Test was designed to measure knowledge of information on the standard Naval letter, classified letter, and endorsement to the standard Naval letter. The reliability of the test was .92.

Procedure for Collection of Data

Permission to conduct this research study and to test the Navy students at the Naval Technical Training Center, Meridian, Mississippi, was secured from Commander Barbara F. Beil, Commanding Officer, Naval Technical Training Center, Meridian, Mississippi.

Each student's Armed Services Vocational Aptitude Battery (ASVAB) scores were obtained with the identity of the students limited to Department of Defense personnel.

Prior to entering the Yeoman "A" School 100 students were required to take the Learning Styles Inventory, the Nelson-Denny Reading Test, Form C (1973), and Yeoman "A" School Achievement Test.

After completing a series of lessons, the Yeoman "A" School Achievement Test was readministered.

Methods of Data Analysis

Results of this study were derived through the use of analysis of covariance, stepwise multiple regression and r to z transformation

statistical models. Statistical programs prepared in the Statistical Package for Social Sciences (SPSS) published by Nie and Associates (1975) were employed for data analysis.

Results of Study

Differences in Achievement

The first research question asked if there would be significant differences in achievement of the Yeoman "A" School students taught by CAI and traditional self-paced instruction when variables of pre-achievement and aptitude were statistically controlled. A pre-analysis was conducted to determine that there was no significant difference in the aptitude of the two groups as measured by the seven subscales of the ASVAB instruments considered in this study. Consequently, it was assumed that the two groups did not differ in aptitude. An analysis of covariance model was used to test for difference in achievement gains between the two groups. The posttest scores were used as the dependent variable and the pretest scores were employed as a covariate to statistically control for initial differences in achievement in the subject area considered. The independent variable was method of instruction.

A comparison of residualized means resulting from this analysis of covariance is given in Table 1. Adjusted or residualized means are interpreted as achievement gains. As shown, an F ratio of 5.06 was derived in this analysis, indicating that significant difference (.05 level) existed in the achievement gains of the two groups. An F ratio of 3.96 is needed for significance at that level. From an observation of the adjusted group means, it is observed that the CAI group had a mean of 45.90 while the traditional self-paced group had an adjusted mean of 44.22. These data show that the CAI group achieved significantly higher than did their counterparts in the traditional self-paced program.

Table 1

Comparison of Achievement for
Naval Personnel Taught by Computer
Assisted Instruction (CAI) and
Traditional Methods

Groups	N	Adjusted Posttest Means	F
CAI	50	45.90	
Traditional Self-Paced Instruction	50	44.22	
			5.06*

*$F \geq 3.96$ significant at .05 level

Variables Predicting Achievement

The second question asked what combination of the variables of student learning styles, reading vocabulary and comprehension, aptitude for learning and method of instruction best predicted achievement among the students. A stepwise multiple regression statistical model employing posttest scores as the dependent variable was employed for this analysis. Potential predictors of achievement considered were the seven ASVAB scores, the sixteen learning style variables, and achievement scores in reading vocabulary and comprehension. The pretest scores on the criterion-referenced test were forced into the regression model first in order to control for initial differences in achievement among students in the two groups. Results of this analysis are given in Table 2.

Five variables were found to make statistically significant contributions to the prediction of achievement. They were: pretest scores, the ASVAB scores of knowledge of mathematics, word knowledge, and mechanical comprehension, as well as the type of instructional method used (CAI vs. traditional). This total set of variables explained 44.39% of the total variance in achievement as indicated by the cumulative R^2. The variable most associated with achievement was knowledge of mathematics. That ASVAB score was associated with 23.59% of the variance. The negative simple correlation between teaching method and achievement ($r = -.18$) indicated that achievement was better fostered in the CAI group (CAI instruction was coded 0 and traditional instruction was coded 1 for the regression analysis).

In summary, after pretest achievement was controlled, those who achieved better in the unit of instruction, as contrasted to lower achieving students, were those who had more knowledge of mathematics, had

Table 2

Predicting Achievement (Posttest Scores) through Use of Variables Associated with Teaching Methodology, ASVAB Scores and Learning Styles for Total Group of Students

Predictor Variables	Multiple R	R^2	R^2 Added	Simple r	F to Enter Prediction
Pretest	.3326	.1106	.1106	.33	12.19 **
Knowledge of Mathematics (ASVAB)	.5886	.3465	.2359	.57	35.01 **
Word Knowledge (ASVAB)	.6186	.3826	.0362	.50	5.63*
Method (CAI or Traditional)	.6473	.4190	.0363	-.18	5.94*
Mechanical Comprehension (ASVAB)	.6662	.4439	.0248	.41	4.20*

*F —— 3.96 significant at .05 level

**F —— 6.96 significant at .01 level

more word knowledge and had better mechanical comprehension. They were also taught in the CAI program.

The inclusion of both methodological variables and personal variables in the regression analysis showed that an interaction between the aptitude variables and teaching methodology existed. Hence, two other regression analyses were conducted to determine the relationship of the aptitude, learning style and reading achievement variables to the Yeomen's achievement when they were separated into two groups on the basis of the method by which they were taught.

The relationship of these variables to achievement among those taught by CAI are given in Table 3. Here the relationship of all variables contributing at least one percent to the variance in achievement are presented. In addition to the pretest which was forced into the analysis, eight other variables were considered to make enough contribution to the prediction equation to be discussed in the analysis. Of this group, three variables in addition to the pretest were significantly related to the achievement of the CAI group. These variables were mathematical knowledge, arithmetic reasoning and lack of preference for reading as a learning style. These variables in combination with the pretest scores predicted 47.20% of the variance in achievement. Another set of five variables contributed to an additional eight percent of the variance. These variables were interests in numeric learning situations (negatively related), aptitude for numerical operations, the desire for detail and competition in learning styles (negatively related) and aptitude for mechanical comprehension (positively related). Altogether this set of nine variables explained 62.96% of the variance in achievement among the CAI group.

Table 3

Predicting Achievement (Posttest Scores) through use of variables associated with ASVAB Scores and Learning Styles for Student taught by use of Computer Assisted Instruction

Predictor Variables	Multiple R	R^2	R^2 added	Simple r	F to Enter Prediction
Pretest	.4009	.1607	.1607	.40	9.1? **
Mathematical Knowledge (ASVAB)	.6378	.4068	.2461	.63	19.50 **
Arithmetic reasoning (ASVAB)	.6870	.4720	.0652	.60	5.68 **
Reading as preferred learning style	.7195	.5177	.0457	-.21	4.26 *
Numeric	.7414	.5497	.8320	-.12	3.13
Numerical Operations (ASVAB)	.7566	.5724	.0227	-.23	2.28
Competition	.7689	.5913	.0189	-.06	1.94
Details	.7839	.6177	.0264	-.23	2.83
Mechanical Comprehension (ASVAB)	.7934	.6296	.0119	.46	1.28

*F $\geq$ 6.04 Significant at .05 level

**F $\geq$ 7.19 Significant at .01 level

A similar analysis was done for predicting achievement among the traditional self-paced instructional group. Results of this study are reported in Table 4. Only one variable in addition to the pretest scores was significantly related to achievement among Yeomen taught by the traditional self-paced instructional program. That variable was aptitude for general science and that variable was associated with 31.14% of the variance in achievement gains for that group. Two ASVAB measures, mathematical knowledge and mechanical comprehension, as well as five learning style variables, preference for qualitative experiences (negative), need for liking instructor (negative), need for goal setting (positive), desire for competition (positive), and preference for learning situations using iconics (positive), were associated with students' achievement in the traditional self-paced group. In addition, reading comprehension was negatively correlated with achievement among these groups.

Differences in Relationships of Variables

These data indicated that different patterns of variables contributed to achievement of students within the two groups taught by different methods, indicating that certain aptitudes and learning styles were more associated with student achievement in one instructional group than the other. A final analysis was conducted to determine if the variables related to achievement differently in the two instructional groups.

Partial correlations were derived from the previous regression analyses for the two groups. This analysis consisted of partialing out the variance associated with posttest scores by the use of pretest scores. These "adjusted" scores were then correlated with all the potential predictor variables. Results of this analysis are given in Table 5. As can be noted on this table, different patterns of variables did predict

Table 4

Predicting Achievement (Posttest Scores) through Use of Variables Associated with ASVAB Scores and Learning Styles for Students Taught by Traditional Self Paced Methods

Predictor Variables	Multiple R	R^2	R^2 Added	Simple r	F to enter Prediction
Pretest	.2933	.0860	.0860	.29	4.52 *
General Science (ASVAB)	.6304	.3974	.3114	.62	24.29 **
Qualitive	.6576	.4318	.0344	-.33	2.78
Mathematical Knowledge (ASVAB)	.6893	.4751	.0433	.51	3.71
Liking instructor	.7114	.5062	.0310	-.15	2.77
Goal setting	.7262	.5273	.0211	.01	1.92
Competition	.7391	.5463	.0189	.44	1.75
Iconic	.7524	.5660	.0198	.32	1.87
Mechanical Comprehension (ASVAB)	.7630	.5821	.0161	.11	1.54
Reading Comprehension	.7746	.6000	.0178	-.04	1.74

*F — 4.04 Significant at .05 level

**F — 7.19 Significant at .01 level

Table 5

Partial Correlation showing relationship of ASVAB Scores, Learning Style Variables and Reading Achievement to Achievement Gains for Two Groups

Variables	Computer Assisted Instruction partial r	Traditional Self-paced Instruction partial r	z
ASVAB Scores			
Word Knowledge	.45 **	.47 **	.25
Arithmetic	.53 **	.36 **	2.10*
Mechanical Comprehensive	.43 **	.46 **	.37
Numerical Operations	-.20	-.06	1.41
Mathematical Knowledge	.54 **	.49 **	.70
General Science	.31 **	.58 **	3.38*
Electronic Information	.34 **	.29 **	.54
LSI Variables			
Working with people	-.11	.15	2.58*
Organizing course work	.01	-.26*	1.73
Goal setting	.28**	.12	1.65
Competition	-.17	-.14	.31
Liking instructor	-.10	-.15	.50
Details	-.28**	-.02	2.65*
Independence	.13	.13	.00

Table 5 (continued)

Variables	Computer-Assisted Instruction Partial r	Traditional Self-paced Instruction Partial r	z
Authority	.11	.01	.99
Numeric	.11	-.09	1.98*
Qualitative	-.16	-.35 **	1.96*
Inanimate	-.32**	.06	2.69*
People	-.12	.20	3.21*
Listening	.06	.11	.50
Reading	-.25*	.05	3.01*
Iconic	.17	.02	1.50
Direct experience	.06	-.08	1.39
Reading Achievement			
Vocabulary	.36**	.41**	.58
Comprehension	.45**	.27**	1.99*

* Significant at .05 level

** Significant at .01 level

achievement gains within the two groups, as indicated by the two previous regression analyses. To clarify the differences in relationships, r to z transformations were effected for the partial correlations of all variables with achievement gains. After the correlation coefficients were transformed, a z test for significant differences was conducted. Significant differences in the relationships of seven variables to achievement of students within the two instruction groups were indicated.

In brief, among the ASVAB measures, two variables showed significant differences. The variable of arithmetic reasoning was related to achievement more for those taught by CAI methods and the general science measure was related more to achievement for the group taught by traditional methods.

Regarding learning styles variables, those who learn better in the traditional group preferred working with people more than did those who learned better in the CAI group. Also, higher achievers in the traditional self-paced group preferred learning about people more than did their counterparts in the CAI group. The traditional group had a higher positive relationship between the preference for reading learning styles and achievement than did the CAI group. The traditional group members who achieved better also had less regard for organizing course work and for learning qualitative related tasks than did the achievers in the CAI group. In contrast, achievement in reading comprehension was more associated with achievement in the Yeoman training module taught by the CAI than in the traditional group.

In summary, in contrast to the traditional self-paced group, achievement in the CAI program was more associated with arithmetic

reasoning, desire for qualitative learning, a preference to work with inanimate objects and more achievement in reading comprehension. Within the traditional self-paced group, in contrast to the CAI group, achievement was more associated with preference for reading as a learning style, desire to work with people and learn by people, and having more aptitude for general science.

Implications of Study

The first implication was associated with the difference in achievement between the two groups taught by different instructional methods. When pre-achievement was controlled statistically, the CAI group achieved significantly higher than did the traditional self-paced instruction group. This association between higher achievement for the CAI group was confirmed in the regression analysis where differences in aptitude and learning styles were partialled out of the analysis. Based on these data, if one of the methods were selected for instruction over the other in this particular unit of instruction, then preference would be given to the computer assisted instructional program.

A second implication was that, overall, the best predictors of achievement among all of the students were pretest scores, knowledge of mathematics, word knowledge and mechanical comprehension. These variables interacting with the type of instruction received (CAI vs. traditional) were all significantly related to overall achievement.

The third implication of significance was the discovery of different sets of variables predicting achievement within the respective two groups. These results appear to indicate that students achieve in different instructional settings relative to their aptitudes, achievement in reading and learning styles. Perhaps serious consideration should be given to

inclusion of learning style inventories in the test batteries given to prospective naval students. Then, different patterns of instruction could be planned for those with different learning styles and aptitudes. These data show that students with more interests in objects or things and less interest in people learned better by computer assisted instruction. More mathematical aptitude also appeared to be associated with the better achievers in that group, also, than in the traditional group. In contrast, the learning styles of the better achievers in the traditional group were more people oriented and the higher achievement in the traditional self-paced group was more associated with achievement in general science than mathematics. Since it is doubtful that a stronger background in mathematics is really needed in achievement in the unit of instruction offered, the strong association with mathematics' aptitude probably reflects a higher abstract intelligence factor. Those doing better in the CAI program appeared to be more concerned with abstractions and less concerned with concreteness, a trait identified with higher mathematical aptitude.

This study needs to be replicated with larger numbers of students in other instructional units before programmatic changes are recommended, but these results offer strong support for the position that consideration should be given to matching learning styles and aptitudes of students to their method of instruction to realize maximum achievement.

REFERENCES

Abel, J. Academic advising: Goals and a delivery system. Journal of College Student Personnel, 1980, 21 (2), 151-155.

Astin, A.W. Predicting academic performance in college. New York: The Free Press, 1971.

Barbe, W., & Swassing, R. H. Teaching through modality strengths: Concepts and practices. Columbus, OH: Zaner-Bloser, Inc., 1979.

Boclair, M. R. Relationship of ACT scores, sophomore grade point average, vocabulary, and reading comprehension, major and sex to preservice teacher's performance on the National Teacher Examinations from July 1978 to February 1980 (Doctoral dissertation, Mississippi State University, 1980). Dissertation Abstracts International, 1981, 41, 3854A (University Microfilms No. 81-05, 172).

Borup, J. H. The validity of the American College Test for discerning and potential academic achievement levels--ethnic and sex groups. The Journal of Educational Research, 1971, 65 (1), 3-6.

Buros, D. K. (Ed.). The eight mental measurement yearbook. Highland Park NJ: Gryphon Press, 1978.

Callison, W. Problems and Possibilities for Computer-Assisted Instruction. NASSP Bulletin, 1981, 65, 24-28.

Canfield, A. A. Learning Styles Inventory. Ann Arbor, MI: Humanics Media, 1980.

Carbo, M. L. An analysis of the relationship between the modality preferences of kindergarteners and selected reading treatment as they affect the learning of a basic sight-word vocabulary (Doctoral dissertation, St. John's University, 1980). Dissertation Abstracts International, 1980, 41, 1389A-1390A (University Microfilms No. 80-21, 790).

Clements, Z. J. Taking all students from where they really are. NASSP Bulletin, 1976, 60, 104-108.

Dunn, R. Another look at individualized instruction. Phi Delta Kappan, 1978, 59, 400-402.

Dunn, R., & Dunn, K. Learning styles: Teaching styles: should they ... can they...be matched? Educational Leadership, 1979, 36 (4), 238-244.

Dunn, R., K., & Price, G. E. Diagnosing learning styles: A prescription for avoiding malpractice suits. Phi Delta Kappan, 1977, 58, 418-420.

Emmer, E. T. Do pupils affect teacher's styles of instruction? Educational Leadership, 1974, 31, 700-704.

Gregorc, A. F. Learning/teaching styles: potent forces behind them. Educational Leadership, 1979, 36, 234-236.

Gregorc, A., & Ward, H. A new definition for individual NASSP Bulletin, 1977, 61, 20-26.

Griggs, S. A., & Price, G. E. Learning styles of gifted versis average junior high school students. Phi Delta Kappan, 1980, 61, 361.

Harste, J., & Burke, C. A new hypothesis for reading learning of reading are theoretically based. In P. D. Pearson's (Ed.), Twenty-sixth yearbook of the National reading conference. Clemson, SC: National Reading Conference, Inc. 1977, 32-40.

Hart, L. The new brain concept of learning. Phi Delta Kappan, February, 1978, 59, 393-396.

Hill, J., & Associates. Personalized education programs utilizing cognitive style mapping. Bloomfield Hills, MI: Oakland Community College, 1971.

Hines, E. R. Academic advising as teaching. Improving College and University Teaching, 1981, 29 (4), 174-175.

Johnson, C. W. Faculty advising of students: Important neglected, some alternatives. College Student Journal, 1979, 13, 328-331.

Kolb, D. A. Disciplinary inquiry norms and student learning styles: Diverse pathways for growth. In A. Chickering (Ed.), The Modern American College. San Francisco, CA: Jossey-Bass Pub. Co., 1981.

Levin, J. R. Individual differences in learning from pictures and words. Journal of Educational Psychology, 1974, 66, 296-303.

Marcus, L. How teachers view student learning styles. NASSP Bulletin, 1977, 61, 112-114.

Messick, s., & Associates. Individuality in learning. San Francisco, CA: Jossey-Bass, 1976.

Olds, H. F. On understanding computers references for a broader vision. Learning, 1983, 11, 30-34.

Reckinger, N. Choice as a way to quality learning. Educational Leadership, 1979, 36, 255-256.

Robinson, J. E., & Gray, J. S. Cognitive styles as a variable in school learning. Journal of Educational Psychology, 1974, 66, 793-799.

Titley, R. W., & Titley, B. S. Academic advising: The neglected dimension in designs for undergraduate education. Teaching of Psychology, 1982, 9 (1), 45-49.

Turner, R. L. The value of variety in teaching styles. Educational Leadership, 1979, 36, 257-258.

Walker, D. F. Reflections on the educational potential and limitations of microcomputers. Phi Delta Kappan, 1984, 65, 103-107.

Walsh, E. M. Revitalizing academic advisement. Personnel and Guidance Journal, 1979, 57, 446-449.

White, W. F., & Bigham, W. D. Information systems approach to admissions, instruction, and retention of college students with developmental lag.

Journal of Research and Development in Education, 1982, 15 (2), 16-26.

Watt, D. H. Classroom computer news. Instructor, 1981, 91, 85-90.

Young, A. D. Classroom climate and class success: A case study at the university level. The Journal of Educational Research, 1977, 70, 252-257.

GOVERNMENT PUBLICATION(S)

Bureau of Naval Personnel Manual, 1440220, July, 1978.